

Original
articleInvestigation of the increased incidence of
gonorrhoea diagnosed in genitourinary medicine
clinics in England, 1994–6

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Objectives: To determine important risk factors associated with cases of gonorrhoea in England, and whether any particular risk groups were associated with the substantial rise in numbers of cases seen between 1994 and 1996.

Design: Two retrospective cross sectional surveys.

Setting: 70 randomly selected genitourinary medicine (GUM) clinics in England.

Subjects: 10% of all gonorrhoea patients attending GUM clinics in England in 1994 (847 patients) and 1996 (1146 patients).

Main outcome measures: For risk factors in 1996 (study 1), unadjusted rates per 100 000 population aged 14–70 and relative rates (RR) with 95% confidence intervals (CIs). For the change in risk factors between 1994 and 1996 (study 2), adjusted odds ratios (ORs) with 95% CIs, derived from logistic regression analyses of data on patients in 1996, with patients in 1994 as the comparison group.

Results: The incidence of gonorrhoea in 1996 was higher in homosexual males (812 per 100 000; RR=30.2, CI= 25.2 to 36.0) compared with heterosexual males (27 per 100 000); in black Caribbeans (467 per 100 000; 21.4, 17.9 to 25.5) and black Africans (235 per 100 000; 10.8, 7.5 to 15.5) compared with white people (22 per 100 000); and in previous GUM clinic attenders (433 per 100 000; 37.93, 35.46 to 40.56) compared with those who had not attended previously (11 per 100 000). However, most patients were either white or heterosexual. Heterosexual patients in 1996 were significantly more likely to have reduced sensitivity to penicillin (2.55, 1.20 to 5.41) than those in 1994. Male homo/bisexual patients in 1996 were significantly more likely to be from the north west (3.77, 1.45 to 9.80) and to have either reduced sensitivity (2.63, 1.03 to 6.73) or complete resistance (1.98, 1.03 to 3.78) to penicillin, compared with those in 1994.

Conclusions: Homo/bisexual men and the black Caribbean population in England experience a disproportionate burden of gonococcal infections, however, the bulk of diagnoses are in white heterosexuals. No single risk group was associated with the rise in numbers of cases between 1994 and 1996. Resistance to penicillin is widespread and has increased in homo/bisexual men, and it is possible that a rise in treatment failures has, to some extent, enhanced transmission of gonorrhoea and contributed to the rise in numbers of diagnoses in this group.

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Keywords: gonorrhoea; genitourinary medicine clinics; England

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Introduction

Between 1995 and 1996, there was a 20% rise in the number of cases of gonorrhoea seen in genitourinary medicine (GUM) clinics in England.¹ This followed a smaller increase between 1994 and 1995¹ and the trend has continued into 1997.² The rise between 1995 and 1996 was the largest proportional annual increase in diagnoses since 1945 (Communicable Disease Surveillance Centre (CDSC), unpublished data). It took place in almost every health region, occurred in heterosexuals as well as in homo/bisexual men, and was greatest in men and women aged 16–19 years.¹

Gonorrhoea rates are thought to be a reasonable indicator of changes in sexual behaviour.³ The dramatic and substantial decline in numbers of people attending medicine GUM with gonorrhoea during the 1980s⁴ may have resulted from changes in sexual behaviour in homosexual men^{5–6} as well as

heterosexuals⁵ associated with the increased media coverage of AIDS. Gonorrhoea is the only sexually transmitted infection for which a target was set in the *Health of the Nation*⁷ as it was thought to be a convenient marker of behaviour likely to influence HIV transmission.⁷ Consequently, the resurgence of gonorrhoea diagnoses during the 1990s is of considerable public health concern.

In looking for possible factors behind the recent rise it is noteworthy that higher rates of gonorrhoea among black groups than among the general white population have recently been highlighted in two urban areas.^{8–9} However, as routine statistics from GUM clinics give limited risk factor information,¹⁰ it was not possible to determine whether black groups are at higher risk throughout England or if they contributed disproportionately to the latest increase.

This investigation had two aims. Firstly, we wished to determine important risk factors for

gonorrhoea at the national level. Secondly, we examined whether the recent rise in numbers of gonorrhoea diagnoses was associated with changes in risk behaviours or with any particular risk group.

Subjects and methods

STUDY DESIGN AND SAMPLE SIZE

The investigation was in two parts: (1) an analysis of risk factors for gonorrhoea patients in 1996 (study 1), and (2) a comparison of risk factors for gonorrhoea in 1996 with those in 1994 to determine whether there had been a significant change in risk factors between these years (study 2). Two cross sectional surveys of gonorrhoea patients attending GUM clinics in 1994 and 1996 were carried out. A total sample size of about 2000—that is, approximately 10% of all patients with gonorrhoea seen in GUM clinics in England in 1994 and 1996, was required in order to detect an odds ratio (OR) of 1.5 or more when 10% or more of patients in 1994 belonged to a risk group (5% significance, 80% power). A necessity to analyse by sexual orientation meant that detectable ORs were 2.4 or more for homo/bisexual men and 1.7 or more for heterosexuals.

SAMPLING STRATEGY

Clinics

Two thirds of genitourinary medicine (GUM) clinics in inner London and a third of GUM clinics in the rest of England were randomly selected from each of nine size categories, determined by the number of gonorrhoea cases they reported in 1996 (0–5, 6–10, 11–20, 21–30, 31–50, 51–100, 101–200, 201–520, or 521–1000). Inner London clinics were deliberately oversampled so that there were sufficient numbers for subgroup analyses of homosexual men. Nine of the 75 selected clinics (12%) were unable to participate and were each replaced with another from the same size class. Four clinics reported no gonorrhoea cases and one was subsequently unable to participate, leaving 70 participating clinics.

Subjects

Listings of all patients attending with uncomplicated gonorrhoea (KC60 code B1B2) at each selected clinic in 1994 and 1996 were generated. One of the first four patients was randomly selected and, thereafter, every fourth patient. Repeat attenders were included. The following information was obtained from the patients' notes and recorded on a standard proforma: Clinic, patient number, date of attendance, sex, date of birth, site of infection, drug sensitivity (only qualitative data on drug sensitivity were collected—that is, we did not collect information on laboratory methodology and minimum inhibitory concentrations), drug given for treatment of gonorrhoea, ethnic group, country of birth, sexual orientation, marital status, number of partners in the past 3 months, sex abroad in the past 3 months, concurrent diagnoses, and date and diagnosis of any previous attendance at a GUM clinic.

DATA ANALYSIS

Unless otherwise specified, the data and analyses presented here include adjustments for the oversampling of patients from inner London clinics. Data from inner London clinics were downweighted by 50%. As there were no more than six repeat attenders included in the data set, both within and between the 2 years, it was not deemed necessary to account for duplicates in the analyses. To determine whether the study patients were representative of all cases of gonorrhoea seen in GUM clinics, study cases from 1996 were compared by sex, age group, sexual orientation, and regional distribution to all gonorrhoea cases seen in GUM clinics in England in 1996 (KC60 data)¹ using χ^2 tests.

Study 1: Risk factors for cases in 1996

Numbers of patients from inner London clinics were halved to account for oversampling. Incidence rates per 100 000 population aged 14–70 and relative rates were calculated for selected patient characteristics in 1996 with denominators derived from 1996 mid-year population estimates¹¹ (region, sex, and age estimates), the 1991 census¹² adjusted for undercoverage by age, sex, and ethnic group¹³ (ethnic group and area of birth estimates) and the National Study of Sexual Attitudes and Lifestyles¹⁴ (sexual orientation and previous GUM clinic attendance estimates). To estimate incidence rates, the number of patients in 1996 was first multiplied by 12 (as after the London clinics were downweighted by 50% one twelfth of patients had been sampled). Relative rates (RRs) in 1996 were calculated from $[C(e)/C(b)]/[P(e)/P(b)]$ where $C(e)$ denotes the proportion of patients exposed, $C(b)$ the proportion of patients with the baseline characteristic, $P(e)$ the proportion of the population exposed, and $P(b)$ the proportion of the population with the baseline characteristic.

Confidence intervals were calculated as for relative risks (equivalent in this case). Cases for which ethnicity was not recorded were assumed to be white and those for which country of birth was not recorded were assumed to have been born in the United Kingdom.

Study 2: Change in risk factors between 1994 and 1996

The odds ratios among those with the disease were compared directly between 1994 and 1996 using logistic regression with being a case in 1996 (as opposed to 1994) as the outcome variable. If a factor is not associated with the outcome variable then the increase in cases observed between 1994 and 1996 is similar in the groups defined by the factor. It was not possible to calculate odds ratios for many sexual behaviour and clinical characteristics for 1994 and 1996 directly, as data on the frequency of these characteristics in the general population are not available. For this method it was assumed that the proportion of the population belonging to a given risk group changed little between 1994 and 1996.

Univariable and multivariable analyses were carried out using STATA software.¹⁵ Data for patients from inner London clinics were given

a sampling weighting of 6, and those from remaining clinics a weighting of 12, since the probabilities of patients from these areas being included in the sample were 1/6 and 1/12, respectively (using the [pweight=] command in stata¹⁵). All patient and infection characteristics collected on the proforma were compared between cases in 1994 and 1996 using univariable analyses. Only those factors which were significant at $p < 0.2$ in the univariable analyses (sex, sex abroad, previous GUM clinic attendance, concurrent acute sexually transmitted infection (STI), site, sensitivity to penicillin, treatment), and those which were of particular interest (region, age, ethnic group, number of partners, previous acute STI), were included as explanatory variables in the multivariable models. Separate models were run for heterosexuals and for homo/bisexual men because the distribution of many demographic and behavioural characteristics varied considerably between these groups. In the heterosexual model, interactions between sex and each of the explanatory variables were investigated. As

there were strong regional differences in the recording of ethnic group in patients' case notes, interactions between region and the presence or absence of ethnic group data were investigated in both models.

Results

Data were collected on 847 patients in 1994 and 1146 patients in 1996, giving an unadjusted total of 1993 patients overall. Just over half of these patients were seen in inner London clinics.

The study patients in 1996 were not significantly different from all cases reported in the 1996 KC60 data set by sex ($\chi^2 = 1.2$; $df = 1$; $p = 0.27$) or age ($\chi^2 = 4.1$; $df = 3$; $p = 0.25$). However, 30% of males in the study in 1996 were homosexual or bisexual, significantly more than the 21% reported nationally ($\chi^2 = 24.4$; $df = 1$; $p < 0.001$). The regional distribution also differed significantly between the two data sets ($\chi^2 = 91.9$; $df = 7$; $p < 0.001$). Patients from the North West and West Midlands accounted for higher and lower proportions, respectively, of patients in the study than all cases.

Table 1 Estimated incidence of gonorrhoea cases diagnosed in GUM clinics in 1996 by selected characteristics

Factor	Number of cases* (%)	Rate per 100 000 population†	Relative rate (95% CI)
Region			
North Thames	211 (25)	56	1.00
South Thames	89 (11)	42	0.76 (0.63,0.93)
North West	148 (17)	38	0.68 (0.55,0.84)
Northern and Yorkshire	37 (4)	10	0.18 (0.12,0.25)
Trent	108 (13)	35	0.64 (0.51,0.80)
Anglia and Oxford	46 (5)	14	0.26 (0.19,0.35)
South and West	55 (6)	14	0.25 (0.19,0.34)
West Midlands	49 (6)	15	0.28 (0.21,0.38)
Sex			
Female	268 (32)	18	1.00
Male	579 (68)	39	2.14 (1.90,2.40)
Age group			
13-15	11 (1)	12	0.13 (0.07,0.24)
16-19	159 (19)	83	1.00
20-24	224 (27)	85	1.02 (0.84,1.25)
25-29	181 (22)	57	0.68 (0.55,0.83)
30-34	124 (15)	36	0.44 (0.35,0.55)
35-44	103 (12)	18	0.21 (0.17,0.27)
45-70	23 (3)	2	0.03 (0.02,0.04)
Not recorded	24 (3)	—	—
Male sexual orientation			
Heterosexual	385 (66)	27	1.00
Homo/bisexual	166 (29)	812	30.15 (25.22,36.04)
Not known	29 (5)	—	—
Female sexual orientation			
Heterosexual	260 (97)	18	1.00
Homo/bisexual	2 (1)	23	1.28 (0.32,5.15)
Not recorded	7 (2)	—	—
Ethnic group			
White	362 (43)	22‡	1.00‡
Black Caribbean	155 (18)	467	21.36 (17.91,25.47)
Black African	31 (4)	235	10.77 (7.51,15.45)
Indian/Pakistani/Bangladeshi	18 (2)	22	1.02 (0.64,1.63)
Other/mixed	32 (4)	72	3.29 (2.30,4.69)
Not recorded	251 (30)	—	—
Area of birth			
UK	614 (72)	21§	1.00§
Rest of Europe	31 (4)	31	1.50 (1.05,2.16)
Latin America and Caribbean	28 (3)	112	5.43 (3.72,7.91)
Africa	17 (2)	64	3.08 (1.91,4.99)
Other	23 (3)	16	0.77 (0.51,1.17)
Not recorded	135 (16)	—	—
Previous GUM attendance			
No	324 (51)	11	1.00
Yes	374 (44)	433	37.93 (35.46,40.56)
Not recorded	34 (5)	—	—

*Adjusted for oversampling of inner London GUM clinics.

†Population sizes were estimated using data from mid-year population estimates for 1996¹¹ (region, sex, and age estimates), the 1991 census¹² adjusted for undercoverage by age, sex, and ethnic group¹³ (ethnic group and area of birth estimates), and the National Study of Sexual Attitudes and Lifestyles¹⁴ (sexual orientation and previous GUM clinic attendance estimates).

‡Includes patients for whom ethnic group was not recorded.

§Includes patients for whom country of birth was not recorded.

STUDY 1: RISK FACTORS FOR GONORRHOEA PATIENTS IN 1996

The distributions of patients in 1996 (adjusted for London oversampling) are presented by region, sex, age group, sexual orientation, ethnic group, area of birth, and previous GUM clinic attendance in table 1.

White people were the largest ethnic group nationally and in all regions except South Thames. Northern and Yorkshire was the only region with no black Caribbean patients recorded and, in the remaining regions, the proportion of patients who were black Caribbean ranged from 4% in the North West to 62% in South Thames. Overall, ethnic group was not recorded for 30% of patients although this ranged from 6% in Trent to 67% in the North West. Ethnic group was not recorded for 10% of patients in South Thames, for 13% in North Thames, and for 20% in the West Midlands. Seventy four per cent of white people and 96% of black Caribbeans were heterosexual.

Twenty nine per cent of patients in 1996 had a concurrent acute sexually transmitted infections (STI) (see box) and 22% had previously had an acute STI. Eight per cent had a penicillin resistant gonococcal strain (that is, all penicillinase producing *Neisseria gonorrhoeae* (PPNG) and chromosomally mediated penicillin resistant *N gonorrhoeae* (CMRNG)) whereas less than 1% were resistant to quinolones or to tetracycline. Penicillin resistance was more common in homo/bisexual men, with 18% of patients resistant, compared with women and heterosexual men, with 4% and 7% resistant, respectively.

Site of infection was recorded for 98% of patients in 1996. Ninety per cent of females, over 99% of heterosexual males, and 67% of homo/bisexual men had genital gonorrhoea. Rectal gonorrhoea was found in 24% of homo/bisexual men and 10% of females, but not in heterosexual males. Throat infections were

Definition of an acute sexually transmitted infection

Infectious syphilis
 Uncomplicated gonorrhoea
 Complicated gonorrhoea
 Chancroid/lymphogranuloma venereum/
 donovanosis
 Uncomplicated chlamydial infection
 Complicated chlamydial infection
 Uncomplicated non-gonococcal/non-specific urethritis in males
 Complicated non-gonococcal/non-specific infection
 Herpes simplex (first attack)
 Wart virus infection (first attack)
 Molluscum contagiosum
 Trichomoniasis
 Scabies/pediculosis

found in 9% of homo/bisexual men but in less than 1% of heterosexual men and women.

Number of partners in the past 3 months, and sex abroad in the past 3 months, was recorded for 98% and 92%, respectively, of patients in 1996. Twenty nine per cent of heterosexual females, 54% of heterosexual males, and 59% of homo/bisexual males reported two or more partners during this period. Five per cent of patients reported sex abroad.

Incidence and relative rates for selected characteristics of patients in 1996 are shown in table 1. Incidence was particularly high for homo/bisexual males compared with heterosexual males, black Caribbean and black African cases relative to white cases, and for those who had previously attended a GUM clinic.

STUDY 2: CHANGE IN RISK FACTORS FOR GONORRHOEA BETWEEN 1994 AND 1996

Descriptive analyses

Between 1994 and 1996, diagnoses in females rose by 25% (215 to 268), in heterosexual males by 46% (263 to 385), and in homo/bisexual males by 31% (126 to 166). In females, the largest increase was in 16–19 year olds and percentage increases diminished with age (fig 1A). In heterosexual males large rises occurred across most age groups (fig 1B) while in homo/bisexual males, the largest proportional increases were in the over 35s (fig 1C).

Multivariable analyses

Adjusted risk factors for being a gonorrhoea patient in 1996 compared to being a patient in 1994 are presented in table 2.

For heterosexuals, patients in 1996 were significantly more likely to be males, to have had no or one sexual partners in the past 3 months compared with two, and to have reduced sensitivity to penicillin than cases in 1994. There were no interactions between sex and any of the explanatory variables in the model.

For homo/bisexual men, patients in 1996 were significantly more likely to be from the North West and to have either reduced sensitivity or complete resistance to penicillin than cases in 1994.

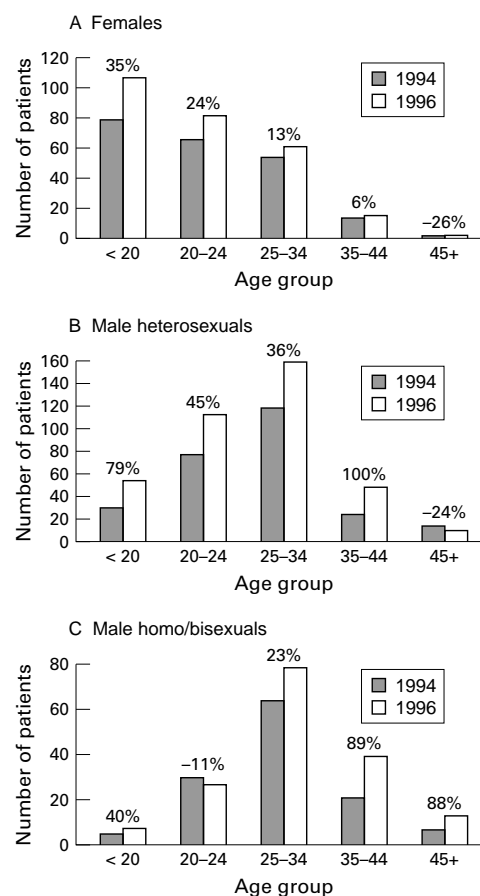


Figure 1 Gonorrhoea patients in 1994 and 1996 by age group: numbers of patients adjusted for oversampling in inner London clinics and percentage changes

There was evidence for an interaction between region and the presence or absence of ethnic data ($\chi^2 = 13.7$, $df=7$, $p=0.057$ for the heterosexual model; $\chi^2 = 14.6$, $df=3$, $p=0.002$ for the male homo/bisexual model). Clinics in the Thames regions improved the recording of ethnic data between 1994 and 1996, whereas clinics in other regions did not.

Discussion

We report on the first national investigation of risk factors associated with cases of gonorrhoea, and of possible causes of the recent rise in numbers of diagnoses, in a study which sampled 10% of all gonorrhoea patients attending GUM clinics in England in 1994 and 1996. Overall, gonorrhoea patients selected for this study were found to be fairly representative of all gonorrhoea cases seen in GUM clinics in England. The oversampling of cases from the North West and of homo/bisexual men probably arose from the random sampling of particularly large clinics in the North West, and of clinics attended predominantly by homo/bisexual men. Consequently, the incidence and relative rate of gonorrhoea in homo/bisexual men and in the North West region in 1996 are likely to be overestimated.

STUDY 1: RISK FACTORS FOR GONORRHOEA PATIENTS IN 1996

The high rates of gonorrhoea in homo/bisexual men are of continuing concern. This study

Table 2 Adjusted risk factors for being a case of gonorrhoea in 1996 compared with being a case in 1994

Variable	Heterosexual men and women (n=1173)			Homo/bisexual men (n=388)		
	Odds ratio (adjusted)	95% CI	p Value	Odds ratio (adjusted)	95% CI	p Value
Sex						
Male	1.00			Not applicable		
Female	0.72	0.53–0.97	0.02			
Region						
North Thames	1.00			1.00		
South Thames	0.97	0.67–1.39		1.87	0.91–3.82	
North West	1.54	0.88–2.70		3.77	1.45–9.80	
Northern and Yorkshire	2.03	0.86–4.81		0.15	0.01–3.01	
Trent	0.82	0.51–1.31		1.13	0.32–4.04	
Anglia and Oxford	0.81	0.46–1.44		1.18	0.38–3.69	
South and West	0.80	0.44–1.47		1.17	0.32–4.30	0.004
West Midlands	1.21	0.65–2.27	0.06	—*		
Age	0.99	0.98–1.02	0.97	1.01	0.98–1.05	0.40
Ethnic group						
White	1.00			1.00		
Black Caribbean	1.24	0.85–1.80		6.68†	0.70–63.43	
Black African	0.63	0.35–1.13		1.78	0.41–7.71	
Indian/Pakistani/Bangladeshi	0.63	0.28–1.38		—*		
Other/mixed	0.72	0.39–1.33	0.09	0.67	0.13–3.53	0.04
Partners in last 3 months						
0–1	1.00			1.00		
2	0.70	0.52–0.93		0.96	0.56–1.63	
3 or more	1.07	0.64–1.79	0.02	1.36	0.72–2.56	0.69
Sex abroad in past 3 months	0.71	0.39–1.28	0.22	—*		
Previous GUM clinic attendance	0.75	0.52–1.08	0.10	0.85	0.49–1.47	0.53
Concurrent acute STI	1.24	0.93–1.65	0.13	0.99	0.48–2.04	0.97
Previous acute STI	1.19	0.79–1.80	0.39	1.40	0.78–2.51	0.26
Site of infection‡						
Genital	1.00			1.00		
Rectal	1.74	0.81–3.73		0.92	0.54–1.57	
Throat	1.78	0.34–9.35	0.26	0.78	0.36–1.69	0.79
Sensitivity to penicillin						
Sensitive	1.00			1.00		
Reduced sensitivity	2.55	1.20–5.41		2.63	1.03–6.73	
Resistant	0.76	0.47–1.27	0.01	1.98	1.03–3.78	0.02
Treatment§						
Penicillin	1.00			1.00		
Quinolone	0.92	0.66–1.30		1.12	0.66–1.90	
Other drug type	0.71	0.42–1.20	0.36	0.33	0.09–1.20	0.10

*Not estimable owing to small numbers.

†Estimated from one patient in 1994 and six patients in 1996.

‡Multiple site infections were categorised as follows: “rectal” includes concurrent genital, throat, and “other” infections, “genital” includes concurrent throat and “other” infections but not rectal infections, and “throat” includes infections of the throat only.

§Relates solely to drugs given to treat gonococcal infection. For multiple treatments “quinolone” includes penicillin treatment and “other drug type” includes penicillin and/or quinolone treatment.

indicated that about a quarter of infections in homo/bisexual men were rectal, whereas infections of the throat only, indicative of safer sexual behaviour in terms of HIV transmission,¹⁶ made up fewer than 10% of cases. Variations on policy on anatomical sites routinely screened for gonorrhoea may have led to an underestimate of the proportion of rectal and throat infections. Clearly, however, many homo/bisexual men attending GUM clinics with gonorrhoea have placed themselves at risk of HIV infection through unsafe sexual practice. In 1997, an estimated 9% of homo/bisexual men attending GUM clinics in London, and 4% attending clinics elsewhere in England and Wales, were infected with HIV.¹⁷

At the national level, incidence of gonorrhoea was far higher for black Caribbeans, who constituted at least 18% of all patients, than for white people. This is in accordance with results from localised studies.^{8–9} None the less, the bulk of gonorrhoea patients were white heterosexuals.

Recording of ethnicity tended to be better in the Thames regions, which along with the West Midlands have much higher black ethnic minority populations.¹² To prevent overestimation of relative rates for gonorrhoea in ethnic minorities, cases for which ethnicity and/or

country of birth data were not recorded were assumed to be white and/or born in the United Kingdom. This was reasonable since areas with the most missing data have relatively small black ethnic minority populations. The likely effect of misclassification due to this assumption will have been to underestimate the size of relative rates associated with non-white ethnic groups. Variations in the methods of recording ethnicity (such as whether ethnicity is assigned by the patient or clinic reception staff) also place limitations on the robustness of ethnic groupings.

Despite these limitations, this study confirms that the black Caribbean population experiences a disproportionate burden of gonococcal infections. The reasons for the unequal distribution of gonorrhoea across ethnic groups are likely to be complex. Sexual behaviours and mixing patterns are determined by cultural background to a large extent¹⁸ resulting in variations in the transmission patterns of STIs by ethnic group. As people more often have sexual partners within their own ethnic group,¹⁹ existing high levels of infection are likely to be maintained.¹⁸ However, there are known racial inequalities in socioeconomic status and in the access to, and use of, healthcare services,^{18–20} with ethnic minorities being less likely to have access to good

medical care.²⁰ Such inequalities could facilitate infection transmission by limiting access to treatment and the effectiveness of partner notification. None the less, certain studies have suggested that disparities in gonorrhoea prevalence by ethnic group may exist even when controlling for socioeconomic status.^{8–9}

The study suggests that almost one in five homo/bisexual men and about one in 16 heterosexuals presenting with gonorrhoea at GUM clinics in England in 1996 had a penicillin resistant strain. In homo/bisexual men, resistance of gonococcal strains to penicillin had also increased significantly since 1994. Unfortunately, in this study we did not collect information on type of resistance and minimum inhibitory concentration ranges. As there is likely to be considerable variability in the methodology used for measuring resistance, this somewhat limits the significance of this finding. None the less, samples submitted to the genitourinary infection reference laboratory in Bristol indicate that chromosomally mediated resistance to penicillin has been increasing since 1994, whereas penicillinase producing (plasmid) gonococcal strains have declined since 1989.²¹ Penicillin is still the preferred treatment for gonorrhoea in many clinics in the United Kingdom²² and the findings from this study warrant a review of recommended treatment of gonorrhoea at the local, if not the national, level, especially in homo/bisexual men.

Almost half the cases in 1996 had previous contact with GUM clinic services and had presumably received advice on safer sexual behaviour. It is also noteworthy that older homo/bisexual men experienced a greater (though non-significant) rise than younger homo/bisexual men, despite the fact that these men are most likely to have been exposed to the HIV safer sex campaigns in the 1980s. There appears to be scope for improvements in sexual health promotion in GUM clinics as a priority area for the control and prevention of gonorrhoea.

STUDY 2: CHANGE IN RISK FACTORS FOR GONORRHOEA BETWEEN 1994 AND 1996

There is no evidence to suggest that the rise in cases of gonorrhoea seen at GUM clinics in England between 1994 and 1996 was driven by any single risk group. The rise was greatest in heterosexual men but there were also large rises in women and in homo/bisexual men. It is particularly important to recognise that although black Caribbeans are at higher risk than whites for the acquisition of gonorrhoea, the rate of increase of new cases in whites and black Caribbeans was similar. Recording of ethnicity improved in the Thames regions between 1994 and 1996, but not elsewhere, and this may explain the slightly higher (though non-significant) odds ratios associated with black Caribbeans compared with white people. Otherwise, the odds ratios calculated for study 2 are likely to be valid, as a major shift in the size of the various population subgroups between 1994 and 1996 is unlikely.

It is possible that the rise reflects an increase in incidence following sexual behaviour

changes generally. A smaller increase in numbers of diagnoses among homosexual men in 1989 and 1990 was associated with changes in risk behaviour which resulted in increased HIV transmission in this group.²³ Furthermore, the significant increases in penicillin resistant gonorrhoea observed in homo/bisexual men in this study may also have increased the likelihood of treatment failure in this group. If so, it is possible that this enhanced gonorrhoea transmission in homo/bisexual men to some extent and contributed to the rise in numbers of diagnoses.

It is also possible that the rise in numbers of diagnoses could be contributed to by changes in the use of genitourinary medicine services, such as changes in health seeking behaviour resulting from sexual health promotion initiatives, or increased referrals from other health-care settings. A change in attendance resulting from successful health promotion initiatives is perhaps unlikely in this case. Heterosexual males were the largest group in this study, and they experienced the greatest rise. Almost all infections in heterosexual males were genital, and as genital infections in males are usually symptomatic, it is reasonable to conjecture that attendance at the GUM clinic in this group was stimulated by the presence of symptoms. Also, a study of 70 000 attenders at 18 general practices in 1994 found very few were treated for gonorrhoea in this setting (unlike those who presented with genital herpes and warts, half of whom were treated in general practice without being referred to GUM clinics), such that a major shift from general practice to GUM clinics for the treatment of gonorrhoea seems implausible (CDSC, unpublished data).

In heterosexual patients, the rise among teenage females was not significantly greater than in older females but may represent a general sexual health problem in that group.²⁴ The increased number of patients reporting only one sexual partner may be due to increased flow of infections from high risk core groups²⁵ to non-core groups, resulting in a greater proportion of cases in 1996 reporting only one sexual partner. Caution with this interpretation is required, however, given the likelihood of variations in accuracy and recording of information on numbers of partners.

Homosexually acquired gonorrhoea increased particularly in the North West. Given the substantial caseload of HIV infections in the Manchester area,¹⁷ this demonstrates the value of gonorrhoea surveillance data in indicating where there is a potential or real need for local public health action.

The study protocol was submitted to the Public Health Laboratory Service ethics committee who, after consultation with the chairman of the South Thames multicentre research ethics committee (MREC), felt that this study was essentially an outbreak investigation designed to inform immediate public health policy and, as such, did not require ethical approval.

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Contributors: GH, NA, and MC designed the study; GH analysed the results with statistical guidance from NA; GH, MC,

MG, MB, DF-B and AM were involved in interpretation of the results; GH and MG coordinated the study with the help of MB, DF-B, and AM; GH undertook the main writing of the paper.

The following clinicians and clinics participated in the study.

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